



RESULTS OF THE WORLD'S LARGEST ISA TRIAL



ISA INTELLIGENT
SPEED
ADAPTATION



ISA stands for Intelligent Speed Adaptation and involves technology that is intended to help drivers keep the right speed.

THREE-YEAR TRIAL IN BORLÄNGE, LIDKÖPING, LUND AND UMEÅ

During three year's time, some ten thousand voluntary drivers tested technical systems intended to help them keep the right speed. The technique involved is called ISA, which stands for Intelligent Speed Adaptation.

The trial cost SEK 75 million and was conducted as a joint project between the Swedish National Road Administration (SNRA) and the local authorities in Umeå, Borlänge, Lidköping and Lund.

Warning, informative and supportive ISA systems were installed in close to five thousand cars, buses and trucks.



The trial was conducted in four Swedish municipalities.

If the driver drove too fast, light and sound signals were activated in the warning and informative ISA systems. In the supportive ISA system, the accelerator pedal offered resistance, which could be overcome by using the kick-down function.

The ISA trial was conducted primarily in built-up areas with 50 or 30 km/h speed limits, but even a few stretches where the speed is 70, 90 and 110 km/h were included. The test drivers were both private car and commercial drivers.

In order for the ISA system in the vehicles to be able to know the local speed limit within the test area, GSP in combination with a digital map was used in Lund, Lidköping and Borlänge. In Umeå roadside transponders were used.

BORLÄNGE

No of test vehicles: 400

Target group: Private motorists and professional drivers.

Equipment: Information and quality-assurance system using GPS and digital map.

LIDKÖPING

No of test vehicles: 280

Target group: Private motorists, companies and local authority vehicles.

Equipment: Information and active support system using GPS and digital map.

LUND

No of test vehicles: 290

Target group: Private motorists, professional drivers and public transport.

Equipment: Active support system using GPS and digital map.

UMEÅ

No of test vehicles: 4000

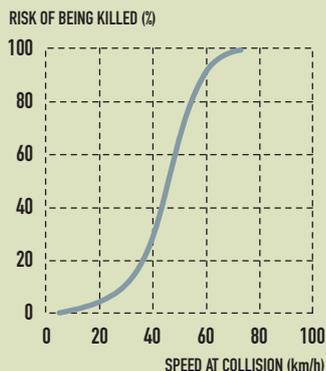
Target group: Private motorists, professional drivers and public transport.

Equipment: Information system using terrestrial transmitters.



SUMMARY OF THE RESULTS

- The test drivers in the ISA trial were considered to represent the average driver in Sweden quite well.
- On the whole, ISA entailed a substantial improvement in road safety. If everyone had an ISA system in their car, the number of people injured in traffic could be reduced by 20–30 percent.
- Travel times were unchanged (a marginal improvement was even found) despite the lower maximum speed. This is explained by fewer stops and braking situations with ISA. The drivers were skilful in adapting to this new technology and contributed to this result.
- There is a high level of acceptance of ISA in urban areas. A clear majority of the drivers thought that you should keep to the speed limit on 30 and 50 streets.
- ISA is the best idea yet, along with police surveillance, for solving road safety problems on 50 streets in built-up areas. This is where most injuries occur and where the acceptance of physical measures such as road humps is lower than for ISA.
- Approximately two of three wanted to keep the system if it were free, while about one in three could consider paying up to around a thousand Swedish crowns.



SPEED IS OF SIGNIFICANCE

Speed is a highly significant factor in how serious the consequences of an accident can be. Particularly in built-up areas. Seven of ten pedestrians who are hit by a car driving at 50 km/h are killed, whereas at a speed of 30 km/h, nine out of ten survive.

Almost everyone whose opinion was consulted thought that it is important to keep to the speed limit. Despite this, more than half admitted that they often or quite often had driven too fast during the past year. Many find it difficult to keep to the speed limit and consider ISA to be good assistance.

Useful support for the driver

Effective way to keep to the speed limit



USE AND ATTITUDE



Over 50,000 questionnaires were completed by test drivers and members of the general public before, during and after the ISA trial. These questionnaires revealed their outlook on the need for support, how test drivers felt road safety had been affected as well as their views regarding the impact on the environment and personal integrity.

Most test drivers, 70–80 percent, thought that ISA is good but that police surveillance is better. ISA is much less accepted by commercial drivers due to their stressful work situation.

NEED FOR SUPPORT TEST DRIVERS THOUGHT:



- It is easier to keep to the speed limit using ISA.
- ISA is good on 50 streets.
- 30 km/h is good past daycare centres and schools, and ISA is good support there.
- ISA is better than physical obstacles, like road humps.



- General 30-zones are not good, which was revealed in both the questionnaires and in the driving behaviour logs.
- 70 km/h on rural highways is too low.

ROAD SAFETY TEST DRIVERS THOUGHT:



- People become better drivers when using ISA.
- The risk of being caught for speeding is considerably less.
- They had become more aware of the presence of pedestrians.
- Less time was spent looking at the speedometer when using the supportive ISA system (active accelerator).
- ISA is not considered stressful.



- More time was spent looking at the speedometer when using an informative ISA system (light and sound signals).
- They had hampered other drivers when using the supportive ISA system (active accelerator).

ENVIRONMENT AND INTEGRITY TEST DRIVERS THOUGHT:



- Driving speeds were less erratic.
- Fuel consumption had decreased somewhat.



- There was somewhat less joy in driving.
- The feeling of being controlled grew somewhat.

ISA IN COMMERCIAL VEHICLES TEST DRIVERS THOUGHT:



- Road safety is important and ISA is good in principle.



- ISA was a source of stress in their work situation.



TEST DRIVERS' VIEWS ON ISA

WANTS TO CONTINUE USING ISA AFTER THE TRIAL

Erik Bransell is a test driver in Borlänge. Since the turn of the year his car has been "beeping" when he has driven too fast – a sound that has not been as annoying as he had feared ahead of time.

"Our children are quite young and I was a little worried that the sound might frighten them enough to wake them up if they had fallen asleep. But there has been no problem at all. The sound level is perfectly okay. You hear it and can correct your speed, but it isn't irritating."

Erik appreciates the support that always makes it possible to check what the speed limit is and at the same time warns you if you start to drive a little too fast.

Erik would gladly see the equipment being available after this round of tests, preferably covering a larger geographical area.



WITH A LIGHT FOOT ON THE ACCELERATOR

Jonas Åkesson works at Lunds Energi as a service engineer for the district heating network. Jonas was one of the commercial drivers in Lunds ISA trial and he thinks ISA is good.

"Yes, ISA is good support. Once you reach the right speed, you feel a resistance, and then you just keep your foot lightly on the accelerator."

Jonas' service car is a Renault Megane fitted with an active accelerator.



LOWER FUEL CONSUMPTION

Tomas Leijon tested supportive ISA (active accelerator) and thinks he has become more environmentally conscious and a safer driver with ISA.

"The active gas pedal is super. I've been able to reduce my fuel consumption by about 1–2 decilitres per 10 kilometres! Now, for example, I keep to the speed limit past schools, for example, and there is no risk of missing a 30 sign."

Tomas appreciated the opportunity to use the active accelerator outside the test area as well.

"To adjust the support in the accelerator pedal at a comfortable and legal speed, makes the trip more relaxing for both me and my passengers."

FURTHER DEVELOPMENT OF THE TECHNOLOGY SHOULD BE POSSIBLE

Sandra Fäger tested informative ISA (light and sound signal) and felt that it was a good support.

"ISA helped me stand up against the traffic rhythm, and you don't miss any signs. But you must also remember that you only have the ISA support in Lidköping and remind yourself of this when driving outside the test area."

Sandra also thinks that it should be possible to further develop the technology so that GPS could be used for something else as well, for example route guidance.

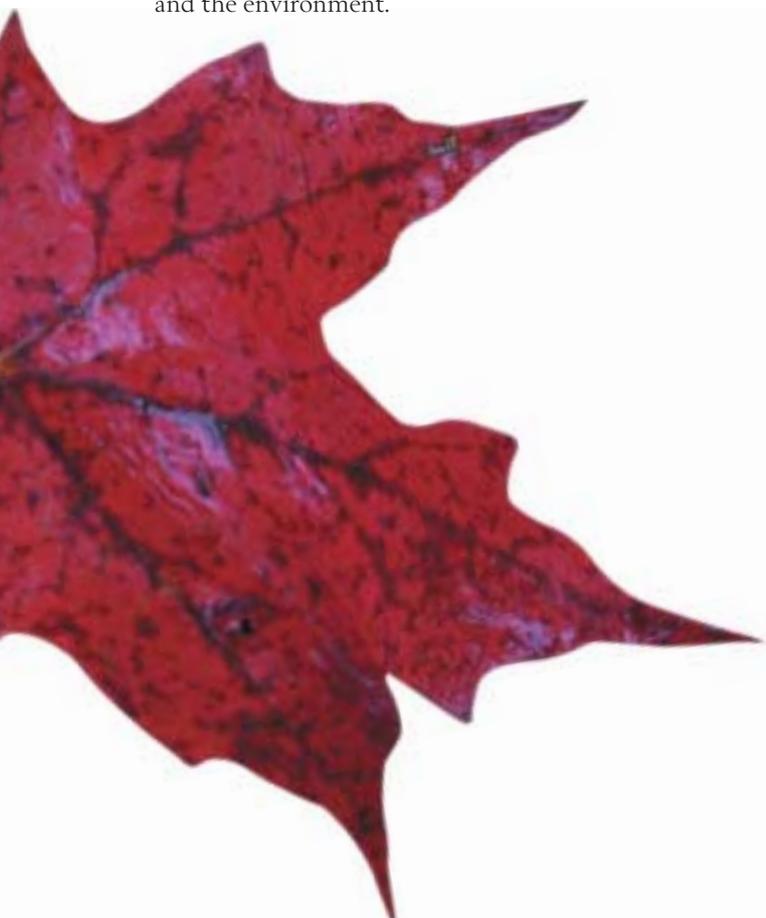


In Umeå, where ten percent of the vehicles were equipped with ISA, the risk of being involved in an accident causing injury on a 30 or 50 street was reduced by about three to four percent. During the same period, the corresponding risk in the country as a whole increased by four to five percent.



IMPACT ON ROAD SAFETY AND THE ENVIRONMENT

Traffic surveys were conducted before, during and after the ISA trial. Large quantities of data were also provided from equipment that continuously logged driving data in some of the test vehicles. This material was used to develop a picture of the impact of ISA on road safety and the environment.



SPEEDS ON ROADS AND STREETS SURVEYS SHOWED:



- A clear decrease in speed violations at all speed limits.
- Driving speeds on 50 and 70 stretches were clearly reduced.
- Driving speeds decreased the most for vehicles that drove the fastest.
- Driving speeds decreased more on stretches with the highest average speeds.



- Speed reductions for vehicles with warning/informative ISA (light and sound signals) diminished over time (about 50 percent after one year).
- Driving speeds on 30 stretches had not decreased as much as the drivers had experienced it.

DIFFERENCES IN SPEED SURVEYS SHOWED:



- Differences in speed decreased for the vehicles in the ISA group, which means less risk of rear end collisions.



- Differences in speed increased for vehicles in traffic as a whole due to the decreased speed of the ISA vehicles.

Drivers keep to the speed limit better

50

Decreasing the speed from 55 to 50 km/h reduces accidents involving human injury by 20 percent. In other words, even the small decrease in the average speed achieved through ISA has a large effect on road safety.



THE ENVIRONMENT SURVEYS SHOWED:



- Carbon monoxide emissions decreased by eleven percent.
- Nitric oxide emissions decreased by seven percent.
- Hydrocarbon emissions decreased by eight percent.
- Carbon dioxide emissions decreased by one percent.

BEHAVIOUR AT INTERSECTIONS SURVEYS SHOWED:



- Drivers approached intersections at a somewhat lower speed.
- Speeds reduced most at three-leg intersections.
- Giving way in intersections was somewhat less hazardous, due to better headway.
- No change in the already low speeds at roundabouts.
- Speed when turning corners not affected.

Improved road safety

Better environment

OTHERWISE SURVEYS SHOWED:



- Fewer conflicts in traffic.
- Drivers kept better headway.
- Drivers with ISA showed more consideration.
- No change in travel times, despite the lower maximum speed.
- Even vehicles that did not have ISA were affected. Their average and maximum speeds decreased.
- ISA had the greatest effect where there were the greatest problems, i.e., on 50 roads.



INTEGRATION OF ISA IN VEHICLES

For ISA to produce the best effect and be accepted by drivers, the in-vehicle design must be done in the right way. The test drivers very much liked both the warning/informative ISA (light and sound signals) and supportive ISA (active accelerator).

TECHNICAL DEVELOPMENT NEEDED

The ISA equipment used in the trial consisted of prototypes. Although the technology saw further development during the course of the trial, there is still much left to do in order to produce reliable and exact ISA techniques.

SPEED SIGN INSIDE THE VEHICLE

Users want to be able to see the speed limit displayed in the vehicle. It is essential that this corresponds to what is shown on the signs outside the vehicle.

SAME AS THE SPEEDOMETER

Speedometers in most vehicles indicate a higher speed of driving than what is actually the case, with a margin of error up to 15 percent. This means that the ISA system reacts at too high a speed according to the speedometer, something that the test drivers found irritating. Greater demands should be placed on speedometers in the future. One solution could quite simply be for ISA to replace speedometers.

OWN CHOICE

The test drivers who used the warning/informative ISA (light and sound signals) would have liked to be able to change the sound signal. Many thought that quiet, discreet systems only perceived by the driver were preferable.

DESIGN

The test drivers wanted a more attractive design for the ISA equipment.



A new type of informative ISA system was tested in Borlänge and Lidköping where the driver was informed about the prevailing speed limit via a display. If he or she drove too fast, a sound signal was heard and a light turned on. This system knows the speed limit through an onboard computer that compares the co-ordinates from the GPS receiver with a digital map onto which the speed limits have been entered.

A warning ISA system without a display of the prevailing speed limit was tested in Umeå. If the driver drove too fast, a sound signal was heard and a red symbol was lit up. In this case, roadside transponders were used to tell the ISA system what the speed limit was.



A supportive ISA system was tested in Lund and Lidköping where the driver received information about the prevailing speed limit via a display. If he or she drove too fast, a resistance was felt in the accelerator pedal, something that could be overcome through a kick-down function. This system knows the speed limit through an onboard computer that compares the co-ordinates from the GPS receiver with a digital map onto which the speed limits have been entered.





PREREQUISITES FOR ISA ON A LARGE SCALE

The ISA trial has shown that there is an acceptance of ISA and that ISA is useful. Test drivers thought that ISA was an effective help in keeping to the speed limit, better than physical obstacles such as road humps. Traffic surveys also showed that ISA leads to better road safety and less negative impact on the environment.

TECHNOLOGY AND DESIGN

The basic idea behind ISA is good, but the technology and design need development. Relevant players in this regard are the automobile industry and companies interested in selling ISA as a standard option on the market.

SPEED DATABASE

For ISA to be able to work, the systems must know the speed limit that applies where the vehicle is driving. A speed database with complete coverage and updated continuously is therefore a must. The position is obtained through a GPS receiver in the vehicle.

VOLUNTARY

There appears to be a great possibility of winning broad acceptance from the general public and the automotive industry for installing ISA as a standard in new cars. However, it seems that voluntary use of ISA is a prerequisite for its widespread implementation in the near future. Every second test driver thought that ISA should be introduced by law for certain groups, for instance, novice drivers and those who have been caught for speeding.

WILLINGNESS TO PAY

Half of the drivers who drove with an informative ISA system (light and sound signals) could consider paying for ISA. The corresponding figure for supportive ISA (active accelerator) was a third. Those test drivers who were willing to pay for ISA thought that warning/informative ISA (light and sound signals) could raise the price of a car by SEK 1000 and supportive ISA (active accelerator) by SEK 1250.

STATE SUBSIDIES

One possible way to stimulate drivers to choose ISA could be to introduce state subsidies for vehicles fitted with an ISA system. As the trial showed that ISA leads to safer driving, even insurance companies should be able to discuss introducing lower premiums for vehicles with ISA.

OFFICIAL TRANSPORTS

The Government and local authorities can set a good example by having their own vehicle fleets equipped with ISA.

In connection with the public procurement of school transports, transportation services for elderly or disabled persons, etc, a safe driver quality provision could be assured through using vehicles equipped with ISA.

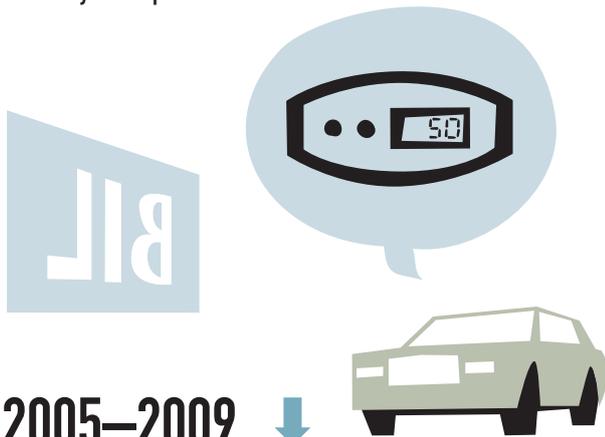
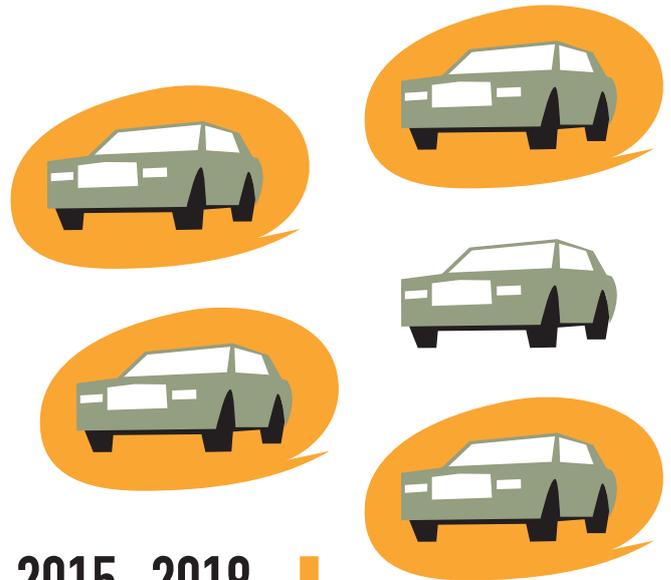




A POSSIBLE SCENARIO FOR THE INTRODUCTION OF ISA

2002–2004 ↓

- Negotiations between the public and private sector concerning regulations for ISA in new vehicles.
- State subsidies for those who have ISA installed voluntarily.
- The SNRA starts having ISA installed in all its own vehicles and requires ISA in its procurement of transport services.
- Intensification of the work on entering speed limits into the national road database.
- Introduction of dynamic speed limits.
- Closer co-operation between public administrations and the automotive industry in Europe.

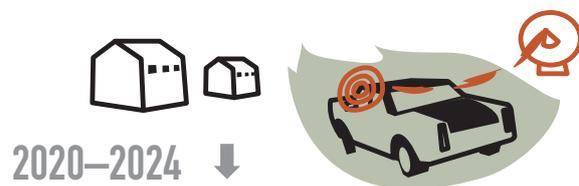


2005–2009 ↓

- In 2005 the Government will present new regulations on ISA being standard in new vehicles.
- Early on in this period ISA will be installed in five percent of older vehicles through the action of the SNRA and other public authorities in connection with the procurement of transport services.
- At the end of the period, ISA market penetration will be up to 35 percent due to the growing demand for ISA from private individuals.
- Standardisation within the automotive industry for ISA to be able to work all over Europe.

2015–2019 ↓

- More than 80 percent of all vehicles have an ISA system, and by 2015 an entirely undramatic decision is passed that ISA will be mandatory in Sweden. Several EU countries have adopted the same decision.
- Access to a well-updated road database in Sweden and in large parts of Europe have resulted in a large number of telematic services such as traffic information, navigation, a number of so-called "mayday" functions, etc having been connected to the ISA systems.



2010–2014 ↓

- Collaboration between the public sector and the automotive industry will have resulted in 2010 being the point in time when ISA will be a mandatory standard in all new vehicles.
- ISA has been installed in 60 percent of all vehicles.
- Greater demand and larger production series will have resulted in such a low cost that ISA no longer needs to be state subsidised.
- ISA has become self-evident and public opinion is favourably disposed to regulating its mandatory use.

2020–2024 ↓

- The extension of mobile data communication has come so far that in principle 100 percent of the European road network is covered.
- In Sweden and large parts of Europe, road authorities have established traffic management centres (TMC) from where all vehicles on the road are constantly being kept updated about necessary route guidance, traffic information and any restrictions.

2025–2030 ↓

- All vehicles are by law connected to a TMC.
- By the end of the period, the SNRA and other road managers will gradually dismantle all road signs since all necessary information is displayed for the driver in vehicles used for travel or transport.





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